REMARKS

Claims 1-64 were examined. Of those, 1-13 and 16-63 were *provisionally* rejected on double patenting grounds and under 35 U.S.C. § 102(e) as anticipated by co-pending Application No. 09/511,113, which has the same inventorship and assignee as the present application. Claim 64 was indicated allowable if rewritten in independent form.

Co-pending Application No. 09/511,113 has been abandoned, thereby obviating the provisional rejections summarized above. Accordingly, claims 6-8 and 17-64 would now appear to be allowable and only those claims rejected on separate grounds (namely claims 1-5 and 9-16) appear to be in dispute. Applicant now addresses the disputed claims.

Rejection under 35 U.S.C. § 102(a) – Greenwald

Claims 1-4 and 9-13 stand rejected under 35 U.S.C. § 102(a) as anticipated by *Non-Blocking Synchronization and System Design*, Ph.D. thesis, Stanford University Technical Report STAN-CS-TR-99-1624, by M. Greenwald (hereafter "*Greenwald*"). For background, Applicant has previously noted that:

> Greenwald discloses two DCAS-based concurrent double-ended queue (deque) algorithms implemented using an array. Unfortunately, Greenwald's algorithms use DCAS in a restrictive way. The first, described in Greenwald, *Non-Blocking Synchronization and System Design*, at pages 196-197, uses a two-word DCAS as if it were a three-word operation, storing two deque end pointers in the same memory word, and performing the DCAS operation on the two-pointer word and a second word containing a value. Apart from the fact that Greenwald's algorithm limits applicability by cutting the index range to half a memory word, it also prevents concurrent access to the two ends of the deque. Greenwald's second algorithm, described in Greenwald, *Non-Blocking Synchronization and System Design*, at pages 217-220, assumes an array of unbounded size, and does not deal with classical array-based issues such as detection of when the deque is empty or full.

See Specification at 1013.

The Office has apparently rejected based on the second algorithm, although Applicants' claims are distinguishable from either. As will be appreciated by those skilled in the art, array-based and list-based concurrent data structures present different advantages and design challenges. One notable distinction is the fixed sized of array-based structures as contrasted with dynamic-sizablity generally provided by list-based structures. Of course, dynamic sizing of list-

based structures comes at the cost of some additional complexity. The design challenges presented by such complexity are particularly significant where correctness and synchronization of competing concurrent access operations is concerned.

Proper distinction between array-based and list-based designs is important when applying *Greenwald* since Greenwald's array-based design is not dynamically-sized. Therefore, in view of the above, Applicant simply notes that claim 1 recites:

A double-ended **concurrent shared object organized as a dynamically sized bi-directional referencing chain of nodes**, the double-ended concurrent shared object employing distinguishing values to indicate spare nodes thereof and supporting concurrent non-interfering opposing-end accesses for states of two or more values.

The disclosure of Greenwald is simply not directed to a "dynamically sized bi-directional referencing chain of nodes." Accordingly, claim 1 and those dependent therefrom (including presently rejected claims 2-5 and 9-15) are all allowable at least for this reason. While claims 14 and 15 were rejected under § 103 over Greenwald, in view of Weiss, Weiss does not add the missing disclosure. Indeed, Weiss is not even concerned with concurrent shared object implementations.

Rejection under 35 U.S.C. § 103(a) – Greenwald in view of Chuang

Claim 16 stands rejected under 35 U.S.C. § 103(a) as obvious over *Greenwald* and "Real-Time Deques, Multihead Turing Machines, and Purely Functional Programming" by *Chuang*. The Office relies on *Greenwald* (as above), but turns to *Chuang* for disclosure of a spare node maintenance operation.

Without reaching the content of *Chuang's* disclosure or the viability of an importation of *Chuang's* techniques into *Greenwald's* design, Applicant simply notes that claim 16 recites:

A method of facilitating concurrent programming using a **dynamically-sized, linked-list representation** of a double ended queue (deque), the method comprising:

encoding the deque using a subset of nodes of **the linked-list**, the linked-list including spare nodes at either or both ends of the deque;

defining opposing-end variants of push and pop access operations on the deque; and

defining opposing-end variants of at least one spare node maintenance operation,

wherein execution of any of the access and spare node maintenance operations is linearizable and non-blocking with respect to any other execution of the access and spare node maintenance operations.

Simply stated, the relied upon disclosure of *Greenwald* is not directed to a "linked-list" method. As a result, claim 16 is allowable and a notice to that effect is respectfully requested.

SUMMARY

In summary, claims 1-64 are in the case. Most rejections have been obviated as a result of abandonment of co-pending Application No. 09/511,113. Remaining rejections have been traversed. All claims are believed to be allowable over the art of record, and a Notice of Allowance to that effect is respectfully solicited. Nonetheless, if any issues remain that could be more efficiently handled by telephone, the Examiner is requested to call the undersigned at the number listed below.

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David W. O'Brien — 23-Apr-04 (Date)

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Respectfully submitted,

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